ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 4.] [1907.

XXIII.—GUTTA PERCHA TREES OF THE MALAY PENINSULA.

J. S. GAMBLE.

The recent publication by the Asiatic Society of Bengal of Part 17 of the "Materials for a Flora of the Malay Peninsula," by Sir George King and the writer, makes it possible to attempt to identify the chief trees, mostly belonging to the natural order *Sapotaceae*, which yield the very valuable "gutta percha." It appears that, so far as is at present known, the *Sapotaceae* of the Malay Peninsula belong to eight genera and include 50 species, mostly large trees, valuable not only for gutta percha but as yielding strong and durable timbers, mostly of a reddish colour, hard, and suitable for building purposes and engineering work. The species are here enumerated, with such information about them as has been obtained :—

1. CHRYSOPHYLLUM, one species, *C. Roxburghii*, G. Don. The Star-apple; a moderate-sized tree with edible fruit and useful wood.

2. SARCOSPERMA, one species, *S. paniculatum*, Stapf & King. A moderate-sized tree chiefly found among large bamboos, on river banks, or in mixed forest; not known to be a producer of gutta percha.

3. SIDEROXYLON, five species, with a sixth (*S. Wallichianum*, G. Don) of doubtful identification. The most important species is *S. malaccense*, Clarke, which, according to Mr. Cantley, gives the valuable 'Daru' or 'Dedâru' wood. This statement is, however, objected to by Mr. H. N. Ridley, who says, in the *Agricultural Bulletin of the Straits and Federated Malay States* for March, 1906, that the 'Daru' trees he had been shown in Sumatra certainly did not belong to this species. He thinks that probably 'Daru' wood is yielded by more than one species, most of it coming from Sumatra. The question ought to be gone into

1375 Wt 4/07 D & S 29 27805

and definitely settled, and it may be hoped that Mr. Ridley may find time to do it. Of the other species, the most common is evidently *S. ferrugineum*, Hook. & Arn., a small tree which extends also to Burma, the Andaman and Nicobar Islands, the Archipelago, and even to the Philippines and China. *S. firmum*, Pierre, has only been once collected in the Peninsula, but extends to Bangka and the Philippines. The other two species are Peninsular only, *S. Maingayi*, Clarke, and *S. Derryanum*, King & Gamble, the last-named found so far only in Perak. None of the species of this genus are recorded as yielding gutta percha.

4. ISONANDRA, two species, both small trees from Perak, and both apparently rare and new to science, *I. perakensis*, King & Gamble, from elevations of 1,000 to 1,500 ft., and *I. rufa*, King & Gamble, from rather lower down.

5. PAYENA, nine species, some of which are important as giving gutta percha of minor quality. *P. Maingayi*, Clarke, is a large tree with leaves which resemble those of *Palaquium Gutta* in having the lower surface covered with golden-brown pubescence. On this Ridley says : "A quite worthless but beautiful tree which is very often mistaken at first sight for gutta percha. Its conspicuous golden leaves, usually much longer than those of *Palaquium Gutta*, at first glance suggest those of that plant. Its gutta, too, when fresh drawn and set, has the same red speckled appearance as first-class gutta, but never hardens, remaining a putty-like mass which usually at least becomes quite black after a short time. It is very common in Malacca and open country generally in the Peninsula. It is known as 'Malaim Pata,' and is said to give a good durable timber, heavy, and dark brown, used in house-building. It attains the height of about 70 feet. It is one of the numerous plants known as 'Niato,' a name applied to a large number of gutta-producing plants, and, according to Mr. Curtis (late Superintendent of the Penang Botanic Gardens), the Malays call it 'Taban Percha,' the real gutta percha being always known as 'Getah Taban,' and not as '-percha.' The seeds are imported from Sumatra for oil." An allied species, but with glabrous leaves, so far known only from Perak and Borneo, is *P. longipedicellata*, Brace. Both these have rather large flowers.

There are four species with small or medium-sized flowers. Of these the most important is *P. Leerii*, Benth. & Hook. f., which, according to Ridley, is the white gutta percha, 'Getah sundek,' occurring all over the Peninsula as well as in Sumatra, Bangka, Borneo, and Amboina. He says that at one time a good deal of the 'Getah Sundek' was collected in the Dindings, the produce of *P. Leerii*. A full account of the information then available regarding this kind of gutta percha is given in the "Report on the progress and condition of the Royal Gardens at Kew for 1881," p. 40. The first specimens which admitted of identification were sent by M. Bran de St. Pol Lias and Mr. (afterwards Sir Hugh) Low, British Resident in Perak, to Dr. Beauvisage, who identified them with *Kerataphorus Leerii*, Hassk., which species was merged in *Payena* in the "Genera Plantarum." Specimens sent at the same time to Dr. H. Trimen, Director of the Royal Botanic Garden, Peradeniya, were identified by him (Report for 1880) as belonging

to *Payena*. Previous to this, in 1878, Dr. Dennys, Assistant Curator of the Raffles Museum, Singapore, had reported that 'Gutta Sundek' was a somewhat inferior variety of gutta percha to that yielded by 'Gutta Taban' (*Palaquium Gutta*). The information of 1881 was supplemented in 1884 by the following extract from notes by Mr. Wray, published in the "Tropical Agriculturist" for October, 1884, p. 289 :—

"This species grows in swampy places near the coast, and I found one tree with its root in a small creek, the water of which was quite salt, and only a short distance from the regular mangrove trees fringing the stream. The leaves are small, shiny, and have a reddish tint when young. The bark is about three-eighths of an inch thick and dark brown in colour, moderately rough.

"The flowers are white, and the fruit is sweet and eaten by the Malays. Its gutta is like 'Taban Sutra' in appearance, and is collected by scoring the bark, catching the sap and boiling it until it coagulates. A tree measuring 2 feet and 8 inches in circumference at 3 feet from the ground, and 38½ feet to the first branch, that I had felled gave 6½ oz. of gutta."

In the Malay Archipelago *Payena Leerii* appears to be a much more important source of gutta percha than had been suspected. From the important "Observations on Gutta Percha" by Dr. Burck, translated in the "Tropical Agriculturist," it appears to be not uncommon in Southern Sumatra.

In the Palembang district it is known as 'Balam Tandock,' 'Balam Tjabe,' 'Balam Sonte,' 'Balam Troeng.' According to Dr. Burck, M. Van Leer, Health Officer of the 1st Class, from whom Messrs. Teysmann and Binnendyk obtained their specimens, remarks that the 'Pohon Balam' is a tree frequent on high lands, attaining to a great age and exceptionally large girth. Bees form nests on it, and on this account the tree is planted and cultivated more for its wax than for gutta percha. The natives only fell them for the gutta percha when they think them too old to be useful for wax production. The method of collecting the gutta consists "in cutting the tree down, cutting off the crown and making a number of incisions in the trunk and principal branches."

In the district of Soepajang the gutta is called 'Balam Pipis.' Dr. Burck states that the tree grows above elevations of 2,000 ft. in humus soil in thick woods and needs shadow and moist ground. The fruits are pear-shaped, green and hard.

In Bangka the tree, according to Dr. Burck, is known as the 'Koelan.' "The tree produces a large amount of gutta, the fruit is eaten, and the gutta is used for making the handles of billhooks and for buckets, whilst the wood serves for household furniture and oars of prahus."

In West Borneo Dr. Burck identifies with this species the gutta-producing tree known as 'Niato.'

M. de Beauvisage, in his "Contribution à l'étude des origines botaniques de la Gutta-Percha," Paris, 1881, mentions that the tree is called 'Balam Soentei' in the Rhio Archipelago.

Allied to *P. Leerii* is a species, perhaps more common in the Peninsula, extending northwards to Kedah and across to Borneo, *P. Havilandi*, King & Gamble. According to Ridley, it is known as 'S'marum,' and has a gutta percha as good as that of *P. Leerii*.

The most common species of *Payena* in the Malay Peninsula is, however, *P. lucida*, A. DC., of which Ridley says: "A common tree of no great size known as 'Niato,' 'Niato Putih,' 'Niato Balam,' 'Tanjong Hutan' (from a resemblance to *Mimusops Elengi*), but giving no gutta. The timber is poor and not large." Near it, distinguished by ferruginous-pubescent instead of glabrous leaves, is *P. dasyphylla*, Pierre, a large tree, reaching 80 to 100 feet in height and a considerable girth. It has been found on the hills of Larút in Perak and extends to Sumatra and Java, and, according to de Vriese, gives a gutta percha only used for adulteration, though Motley seems to consider this unlikely as so little is produced that it would not be worth using.

There are three other species of *Payena*, so far only imperfectly known and hitherto undescribed: *P. sessilis*, King & Gamble, collected by Ridley in Singapore; *P. obtusifolia*, King & Gamble, collected by Father Scortechini in Perak; and *P. selangorica*, King & Gamble, collected by Ridley in the Bukit Kutu woods of Selangor. None of these have, so far, been reported as giving gutta percha.

6. BASSIA contains, so far as at present known, 17 species, of which no less than 13 have now been described for the first time. *B. aristulata*, King & Gamble, is a tree found by Father Scortechini in Perak and said by him to give a gutta percha. *B. malaccensis*, King & Gamble (*Payena malaccensis*, Clarke), is a tree of Perak, Malacca, and Singapore, apparently quite common and reported by Wray to give a sticky gutta in small quantities. *B. Curtisii*, King & Gamble, a tree of Penang and Perak, is the 'Getah Ganau' of which Wray reports: "It grows on the hills up to an elevation of 2,600 feet. The bark is light grey and the wood seems to be of good quality. The gutta is white and hard and is used only for mixing with better kinds." *B. Motleyana*, Clarke, is an erect lofty tree of swampy places, first described as *Isonandra Motleyana* by de Vriese from specimens collected in Borneo, where it is called 'Kotian.' He says that it produces plenty of gutta, but of bad quality, resinous, and brittle. He says also that the seeds give a clear, yellow viscous oil with the taste of bitter almonds, and that this oil is used in sweetmeats and is much esteemed in Bandjermassin. The remainder of the Malay Peninsula species of *Bassia* are not reported to give gutta percha. The species are: *B. Kingiana*, Brace, a good-sized tree of Perak and Singapore; *B. Kunstleri*, Brace, a tree of the hills of Perak; *B. penicillata*, King & Gamble, a large tree of Province Wellesley, said by Mr. Curtis to be common and to be called 'Minjoto'; *B. laurifolia*, King & Gamble, a good-sized tree of Perak, one variety of which extends to Kedah; *B. rupicola*, King & Gamble, *B. perakensis*, King & Gamble, and *B. cuprea*, King & Gamble, trees of Perak; *B. argentea*, Clarke, a large tree of Malacca; *B. Braceana*, King & Gamble, a spreading tree apparently very common in Penang and Perak, and *B. longistyla*, King & Gamble, of Perak and Singapore, a tree closely allied to it; *B. cuneata*, Blume, a tree of

Malacca and Singapore; *B. penangiana*, King & Gamble, and *B. erythrophylla*, King & Gamble, trees of Penang only collected by Mr. Curtis and apparently scarce.

7. PALAQUIUM, 12 species, among which is the most important of the gutta percha yielders, *P. Gutta*, Burck. It is a large evergreen tree with obovate coriaceous leaves densely covered beneath with golden pubescence. It was first described by Sir W. Hooker in 1847 as *Isonandra Gutta*. In the Kew Gardens Report for 1881 is given a long extract from the report of Dr. Dennys, Curator of the Raffles Museum in Singapore, in 1878, who said that the trees are chiefly found on the slopes of low hills in dense forest, and that in order to procure the juice the "tree is felled and the bark ringed in spaces a foot wide and about 15 to 18 inches apart. The upper end of the tree is usually cut off, as this is said to cause it to bleed more freely. Buckets made of wood, cocoa-nut shells or leaves stitched together are used to collect the juice, which is then poured into a hollow bamboo." The juice is then heated until it solidifies and can be moulded into a convenient shape for transport.

The tree is known as 'Gutta Taban' or 'Taban Merah,' 'merah' meaning *red*. Dr. Dennys says that the term is applied on account of the colour of the flower, but there seems some reason to think that it is from the colour of the gutta percha. Various other names are given by different writers and collectors, but it seems so doubtful that they have properly identified the tree that it is well to leave them for further local investigation.

The following extract is from Mr. Wray's notes and describes his experience of the tree in Perak :—

"This tree, from which the best kind of Gutta Percha is obtained, grows, or rather used to grow, throughout the jungles of the plains of Perak and a short way up the sides of the hills.

"It seems to like a considerable amount of moisture, and will even grow with its roots in a running stream. It is a tree of large size, attaining a diameter of 4 to 5 feet, and a height of between 100 and 200 feet.

"It has large thin buttresses around its base, which often present, on their upper portions, a convex profile, and, on a large tree, attain a height of 6 to 8 feet, and a span at the base of 4 to 5 feet from the trunk. As far as I have yet seen, they never form an arch, but have their lower parts buried in the earth, from the trunk to their extremities.

"When growing in the forest the tree has a clean, straight appearance, the former being due apparently to the bark peeling off in irregular pieces. The bark is of a rich brown-red colour, and from one third to half-an-inch in thickness.

"Inside the epidermis it is of an Indian-red tint; and when cut, the milk white sap comes out, at first in small beads, which, enlarging, soon join and cover the injured part with a coating of a cream-like consistency. The leaves are lanceolate on a young tree, and roundish oval, with abruptly acuminate points on a tree of mature growth. The margin is entire, and they are covered on their undersurface with minute silky warm-brown hairs. The

leaf stalks and young wood are also covered in a similar manner, which gives the whole tree, when looked at from below, a brownish tint, by which it may generally be recognised. The upper surface of the leaf is dark green, and the veins are not prominent. The calyx consists of six sepals, three of which are superior to the others and alternate with them. They are coated, like the backs of the leaves, with silky brown hairs. The corolla is white, and is divided into six petals. The style, which is simple, is sometimes persistent, and may be seen on the ripe fruit. There are six ovules, but one or two seeds only arrive at maturity.

"On the apex of the young fruit the six carpels of which it is formed can be distinctly traced. The fruit is coated like the backs of the leaves, with brown down ; its flesh is soft, and it is sweet, but it has a disagreeable flavour of gutta percha.

"The seeds are very oily, and they are, together with some of the seeds of nearly allied species, collected by the Malays and the Sekais, who dry them in the sun for some days, and then express the oil by putting them between two flat pieces of wood, and applying pressure by clamps and wedges.

"The oil, which is solid at the ordinary temperature (that is up to 90°), is highly esteemed for cooking purposes. Birds, squirrels, monkeys, &c., are very fond of the fruit and of the seeds, which adds to the difficulty of obtaining them.

"It flowers in the month of March and ripens its fruit in June, but the Malays assert that it only fruits once in three or four years.

"The gutta of this variety is red, and the colour is not due to an admixture of bark as is frequently stated. It is probable that other varieties of gutta may be sometimes mixed with bark to make them look like 'Taban Merah' and so command a higher price than they otherwise would ; but the true 'Getah Taban Merah,' is red *per se*, and the water in which it is cleaned, although changed many times, still becomes deeply dyed with that colour. Specimens of this, in fruit, together with wood, bark and gutta, I sent to the Royal Gardens at Kew, Calcutta and Ceylon, on May 30th, 1883."

There is a form of *Palaquium Gutta* known as var. *oblongifolium* which was considered by Dr. Burck to be a distinct species, but which the authors of the "Malay Materials" as well as Mr. Ridley and others agree in making a variety only. It is a very large tree, reaching 80 feet in height and two feet in diameter, and it has larger leaves and rather larger flowers than the type, like which it is an important yielder of gutta percha. Wray gives its name as "Getah Taban Sutra," and says that it prefers the banks of streams at an elevation of about 500 to 600 feet. He says that the gutta percha is of a pale reddish brown and is collected in the same way as that of "Taban Merah."

Allied to *Palaquium Gutta* and having the leaves beneath covered with a similar golden pubescence, is *P. Oxleyanum*, Pierre (*Dichopsis pustulata*, Hemsl.), a common species found in all the provinces of the Peninsula. It is known to Malays as "Taban Sutra" or "Taban Putih" or (according to Wray) "Taban Chaia," and gives a gutta percha of rather inferior quality. Mr. Derry

reports that it is "good but does not yield so freely as, and is not so highly priced as the produce of 'Taban Merah.'" The following extract from Wray's notes as "Taban Putih" seem to refer to this species :—

"This tree cannot be told, by its outward appearance, from *Palaquium Gutta*, except that its leaves are rather larger. It has large buttresses, with convex tops, and the bark is nearly of the same shade, but rather browner. The fruit also seems to be similar, and the flowers are white ; so that it is not until the tree is felled, that any very distinctive character appears. It is then found that the sap, which is much more copious, does not coagulate quickly, and when it does, it is of a dirty white colour, and has a much higher softening point than any of the higher kinds, even boiling water not being sufficiently hot to thoroughly soften it. This tree grows on the hills up to an elevation of 2,500 feet above sea-level.

"I have never seen it growing on the plains, nor in fact lower down than 1,800 feet. It ripens its fruit in the month of February.

"The gutta is collected by felling the tree, ringing the bark, and placing leaves, bamboos, &c., under it to catch the sap ; which is afterwards boiled, and the natives often add salt to hasten its coagulation.

"It is frequently adulterated with the gutta from 'Kayu Gelutong' (*Dyera costulata*, Hook. f.), and from two or three of the species of *Bassia*.

"The usual method of mixing them is to do so before the sap has coagulated, as afterwards, owing to the high melting point of 'Taban Putih,' they cannot be so easily and intimately combined. A tree of ten inches of diameter at four to five feet from the ground, gave 2 lbs. 11 ozs. of fairly clean gutta percha.

"There is a variety which differs from the above in having smaller leaves, and in the shape of the fruit, which is longer in proportion to its breadth. I have found it growing on the hills at 2,300 feet elevation, and it ripens its fruit in the month of February."

The variety referred to is that mentioned in the "Malay Materials" as *P. Oxleyanum* var. *glabrata*, King and Gamble.

P. obovatum, (Griff.) King and Gamble, is a large tree, common throughout the Peninsula and extending northwards to Tenasserim and westwards to Sumatra. It gives, according to Curtis, "only a low class bastard gutta percha of little value ;" but Mr. Kurz reported it as yielding a fair sort of gutta percha, and Ridley also gives it a better character saying that it yields "a fairly good second class white gutta." He gives it the name "Taban Putih," which is also one of the names given to *P. Oxleyanum*, and says, after Curtis, that it is also called "Niato Bunga," "Niato Tembaga," and "Niato Balam," both the words "Niato" and "Balam" being Sumatran equivalent for the Peninsular "Taban." Ridley considers the *Dichopsis Krantziana*, Pierre, to be closely allied to this species. It is a tree of the forests of Cambodia and Cochin China, and its gutta is said by Mr. Ridley to be exported from French Indo-China in the form of twists, but to be only of low value.

P. Maingayi, (Clarke) King and Gamble, is a tree somewhat like *P. obovata*, but has the leaves golden-pubescent instead of grey beneath. It is found in Perak and Malacca, and according to Wray is called "Getah Taban Simpor" also "Gelutong Batu" but has no connection with the real "Gelutong" (*Dyera costulata*, the produce of which is an india-rubber rather than a gutta percha). The following is Wray's account of this species and its gutta percha.

"This tree may be readily distinguished from the foregoing by its large dark green leaves, and by its prominent veins at the back, which are covered by coarse, silky light-brown hairs, the back of the leaf itself being only sparingly covered by them. The bark is about half-an-inch thick, rough, and of a reddish-brown colour, much covered by a greyish lichen. It has medium-sized buttresses, with a concave outline. One tree that I measured was 3 feet 3 inches in diameter, at 6 feet from the ground, and from that height the buttresses sloped out until they reached the ground, having a spread of about 3 feet from the trunk.

"The flower is white, and comes out in the beginning of April or the end of March, but its fruit I have not yet seen.

"I had one tree felled, which, at 3 feet from the ground measured 17 inches in diameter and 63 to the first branch, The weight of gutta obtained was 12 oz. The sap, by the aid of heat, and stirring, coagulated in twenty-three hours after tapping.

"This gutta is sold under the name of 'Getah Putih.' The tree grows on hills up to about the same height as 'Taban Putih.'"

P. Clarkeanum, King & Gamble, is closely allied to *P. Maingayi*, but differ in having much more hairy leaves. It is found in the hills of Perak, and (according to Ridley) Selangor. Wray says of it: "it has not enough gutta in it for it to be worth extraction," and Ridley says: "Mr. Arden, who sent specimens from Selangor, says that the Malays call it 'Getah Ketapang' (doubtless from its resemblance to the 'Ketapang' tree [*Terminalia Catappa*]), and find its latex useful for adulterating gutta percha."

P. xanthochymum, Pierre, the *Dichopsis rubens* of the Flora of British India, is a large handsome tree of Perak, Malacca and Singapore, extending to Borneo, the leaves of which turn bright red when they dry. According to de Vriese it produces a gutta percha of a yellowish colour and second quality, but Ridley says he has never heard of its being utilized in the Peninsula.

P. bancanum, Burck, is a gigantic tree reaching, according to Curtis, 100 feet in height, according to Kunstler 120 feet. It seems to be common in the Peninsula and to be found, across the Straits, in Bangka. Curtis has reported that it gives a kind of gutta percha, and on this Ridley remarks that "it certainly does contain a small quantity, but it appears to be very scanty." He says there is a splendid specimen of it in the Singapore Botanic Gardens.

The remaining five species are mostly scarce and of little importance for gutta percha. *P. Ridleyi*, King & Gamble, which Ridley says is known as "Niato Hitam" or "Maiang," is a large

tree of Singapore with a heavy timber used in house-building, flexible and durable, but difficult to saw.

P. microphyllum, King & Gamble, is a small-leaved species of Singapore, and *P. hexandrum*, (Griff.) King & Gamble, a tree of Malacca and Singapore, described in the Flora of British India as *Dichopsis hexandra*, and said to extend to Burma. *P. Herveyi*, King & Gamble, is a large tree known as "Jongek" or "Jungak." It is found in Perak and Malacca, and Wray says it gives a sticky worthless gutta. Ridley says that it has an inferior light wood and that it does not seem to be common. *P. stellatum*, King & Gamble, is a *Bassia*-like species only once collected, viz., in Perak by Scortechini, who reported it to yield good gutta but in small quantities.

8. MIMUSOPS. In this genus come the two well-known and important trees *M. Elengi*, L., and *M. Kauki*, L., neither of which is, however, known to yield gutta percha.

The result of this enumeration of the Sapotaceous trees of the Malay Peninsula seems to be that the only really important gutta percha tree is *Palaquium Gutta*, the "Taban Merah," with its variety *oblongifolium*, "Taban Sutra"; that three other species afford a second class product, viz.: *P. Oxleyanum*, usually called "Taban Putih" or "Taban Chaia," *P. obovatum*, also called "Taban Putih," and *Payena Leerii* "Sundek"; that a few others give small quantities of poor quality and little value, and that the rest yield none at all. It would seem, therefore, advisable that so far as possible artificial cultivation should be restricted to the four species mentioned, and this is practically what is being done. A brief account of what is being done in the forests of the Peninsula to increase the out-turn of gutta percha, and to utilize in the best way possible the produce of the natural forests, may here be of interest.

In 1900, Mr. H. C. Hill, who had been acting as Inspector-General of Forests in India but was then on furlough, was asked by the Colonial Office to visit the Straits Settlements and the Federated States and advise on forest questions. His concise but very interesting and valuable Reports were printed by the Straits Government. His recommendations, as regards the Straits Settlements, were :—

"(1) The reservation of all areas where the trees (there are several species of *Palaquium* yielding good gutta percha) are found growing naturally, or can be planted with good prospect of success.

"(2) The discontinuance of the experimental planting of all sorts of indigenous and exotic trees, and the concentration of efforts on the formation of one or two large plantations of the most valuable indigenous tree, the Gutta Percha." He further recommends the appointment of an experienced Indian Forest Officer, preferably from Burma, to supervise forest work.

As regards the Federated States his proposals were :—

(1) To declare all "Taban" (*Palaquium*) trees to be "reserved," and to prohibit their being felled.

(2) The reservation of the gutta percha-providing forests and their working by means of a simple working plan. The following extracts give the details of his proposals.

"The systematic working of these forests should be arranged for by means of a plan by which the same area would come under operation after an interval of not less than five years and not more than 10 years. The forest should be divided into a number of blocks (from 5 to 10), and these should be gone over annually one by one. The operation would consist in giving more space and light to each *Palaquium* species tree, and in uncovering the crowns of the trees by either felling or girdling all trees overtopping them, interfering with their side development or tending to suppress them. At the same time, care must be taken not to too suddenly isolate trees that have till then been growing under dense shelter.

"All trees over a certain size, say, 1 foot 6 inches in girth, should be enumerated, when found, and be marked with a ring of white paint, and all suppressed seedlings and saplings, which are not required to form the crop in that particular place, should be dug up for transplantation elsewhere.

"The extraction of the gutta percha, both from the trees and the leaves and twigs, is an important matter.

"It has been the custom of the hill tribes to cut down the tree, and that has led to the disappearance of most if not all of the mature trees. It is rare to find a tree over 1 foot 6 inches in girth. From small incisions made in the bark, I see no reason why trees should not yield up their gutta percha, just as other trees yield their rubber; but should this process fail, it will be necessary to cut down the trees at a suitable age for the production of coppice shoots. In the meantime, experiments should be made in extracting the gutta at different seasons from the living trees, so that by the time the selected and tended areas are fit to yield gutta percha it will be known whether they have to be coppiced or not.

"Processes have been patented for extracting gutta percha from the leaves and twigs, but it is doubtful whether they can be worked profitably at any distance from the forest producing the leaves. The eventual method of treating these forests must remain for future determination.

"The working plan should also prescribe the planting up of all blank areas, in which no *Palaquium* species are growing naturally, the forest being gone over block by block as plants are available and the forest rendered complete. Blanks of less than a square chain (66′ × 66′) need not be considered. This work, owing to the uncertainty of procuring plants, can only follow the improvement fellings and must be independent of them.

"The making of suitable paths and lines of export, in so far as the block divisional lines are insufficient, should also be prescribed in the working plans."

It is interesting to note that he estimates the gutta percha of *Palaquium Gutta* as worth $500 a pikul (133⅓ lbs.), *i.e.*, 3¾ dollars a pound, while that of *P. Oxleyanum* and *Payena Leerii* is only worth $150 a pikul, *i.e.*, 1⅛ dollars a pound.

The officer appointed as Conservator of Forests was Mr. A. M. Burn-Murdoch, and his important paper in Vol. xxxi., p. 309 of the "Indian Forester" 1905, "Some facts about gutta percha" gives a full and valuable account of what has been done to follow out Mr. Hill's recommendations. It is impossible to do better than to quote the following extracts from Mr. Burn-Murdoch's paper.

"*Palaquium Gutta* is found in all four States, the best areas lying between two degrees and five degrees north. It must be considered as a dominant species, but exists at present, owing to the unregulated and wholesale fellings by natives some years ago, only in the seedling and small pole stage.

"It occurs most frequently on the low hills and plains, often on steep hill sides, and up to 2,000 feet above sea-level, and even 3,000. It is found well represented in large blocks of forest, varying in size from a few hundred acres to 10,000 or 15,000 acres in extent, while it may be practically absent in other areas for long distances. On close examination a great many of the young plants are found to be stool shoots, but there are many seedlings also, although seed trees are not now to be found. This looks as if the felling of mature trees did not cease until comparatively recently. The 'Taban' tree is a shade bearer of the most pronounced description, and is able to maintain the struggle for existence successfully, if slowly, in these dense evergreen forests. It grows to a considerable size; the largest I have actual knowledge of in this country was in Penang, and measured when blown down 52 feet in height and 42 inches in circumference at 14 feet from the ground. I have seen mention of a tree 140 feet high in the Philippines, and there is no doubt that it is an exceedingly slow grower. At present poles 30 to 40 feet high are fairly common in these States, but large trees are rarities."

"The qualities of gutta percha became known about 1845, and the demand steadily increased from that time, till in the seventies there was a rush for it by the natives of these States, the price rising rapidly till 1902. Between 1895 and 1900 the exports from Singapore rose from 2,642 tons to 5,831 tons. It may safely be said that from 1890 onwards the natives of these States were doing their best to obtain gutta percha. Their method of extraction consisted in felling every tree they came across and extracting the latex in a wasteful, rough and ready manner, so that by the time the authorities awoke to the fact that *Palaquium* was being exterminated (about 1898), it was too late to save trees large enough to produce gutta percha. It is difficult to see how this could have been prevented, however, as at the time there was no properly organised Forest Department, and whatever measures might have been adopted it would have been impossible to effectively carry out in these dense, unpopulated, evergreen forests.

"In Perak the export of gutta percha was prohibited in 1881, but allowed again in 1887, the issue of passes to collect being prohibited in 1900. The first timber rules, published in 1898 by the British Residents of the various States, contained the initial protective measures, which were to the effect that no rubber-bearing tree should be felled if of less than eight inches diameter.

This rule could not, I imagine, be enforced in practice, owing to the want of an organised staff. In 1899 and 1900 the matter was taken up by the High Commissioner and the Resident-General, and in the latter year the British Resident, Pahang, issued orders to all his officers to do all that lay in their power to prevent the destruction of gutta percha producing trees.

"The question of planting was also discussed, but not in a very practical manner.

"The Forest Department was started in each State by the appointment of a local man, in Perak in 1895, in Selangor in 1898, in Negri Sembilan, in 1899, and in Pahang not till 1902, when a member of the Indian Provincial Forest Service was sent over on deputation at my request, I having been deputed from India in October 1901, as Conservator of Forests.

"Early in 1902 I suggested that an export duty of 80 per cent. *ad valorem* be imposed on all gutta percha leaving these States, as a means of putting a stop to the extraction and collection of this product, a considerable period of absolute rest being obviously indicated for all gutta percha producing trees.

"The rules were also amended and the felling of trees for the extraction of the latex was prohibited. In addition to these precautions departmental instructions were issued to the effect that no licences for the extraction of gutta percha were to be issued. At the present time therefore it must be difficult to collect gutta percha and export it in sufficient quantities to make it pay. That a certain amount of smuggling goes on I have no doubt, from the fact that two or three cases have come to light in which Chinamen were found in possession of small quantities and were convicted of the offence. Since 1902 the staff of the Forest Department has been greatly increased, and I have reason to believe that the Government have done and are now doing all that is in their power to assist in the preservation of this valuable product.

"As regards measures for protection from other causes of destruction, such as alienation of land for mining and agriculture, the only plan is to reserve all the valuable *Palaquium* areas, constituting them forest reserves wherever possible, without interfering with valuable tin-bearing land. We already have an area of about 60,000 acres reserved, fairly rich in young *Palaquium*, chiefly in Perak and Selangor, and probably as much more remains to be taken up in Pahang and elsewhere.

"Again, before any large area of land is alienated the department is referred to, and if alienation takes place in spite of the presence of *Palaquium*, we are given the opportunity of taking away the young plants and transplanting them into reserved areas, In the course of time, when all forest reservation has reached its natural limit, *Palaquium* is bound to disappear from all tracts outside, nor does this matter, as it is only practically possible to watch defined areas when placed completely under the control of the Forest Department.

"The systematic exploitation of the gutta percha areas will only be possible in reserved forests, tracts being taken in hand annually.

"The natural regeneration of *Palaquium*, as already stated, is very good, but growth is slow and assistance must be given. Our object now is to encourage only the best species, *P. oblongifolium* and *P. Gutta*. Regular plantations, *i.e.*, planting in cleared areas from seed, is at present impossible in these States, as no seed is available. The method followed by the Forest Department here is to cut lines through the dense undergrowth in the forest reserves, taking up regular areas in turn, and to transplant into these lines young *Palaquium* seedlings taken from outside the reserve in forests that cannot for various causes be protected, or taken from groups inside the reserve where they are growing too close together. At the present time we have an area of more than 1,000 acres so planted in Selangor.

"In the Trollah reserve in Perak *Palaquium* seedlings are so numerous in the seedling and pole stage that planting over a considerable area is unnecessary. Here we resort only to improvement fellings, transplanting young plants into blanks only wherever necessary. The improvement fellings consist in clearing away undergrowth interfering with young *Palaquium* plants, the operation being repeated yearly or once in several years, as may be necessary. By this means the rate of growth of the young tree is greatly increased. I have found the effect of this process to be very beneficial even in the two years since it was started. By such simple methods as these it is hoped in a few years to have a very considerable area of young *Palaquium* trees about 40 to the acre. One advantage in this system is the freedom from the attacks of insects to which trees grown in pure plantations are liable. A similar area to that in Selangor exists in Malacca, but the plants are put in closer together and were obtained from Sumatra. Similar plantations exist at Bukit timah in Singapore, and at Batu ferringi in Penang, but on a small scale."

Thus it will be seen that the Government of the Straits Settlements and Federated Malay States has taken strong measures to prevent the destruction of the gutta percha forests and to provide for a permanent supply when the reserves and plantations after some years can begin once more to produce a regular yield.

XXIV.—FUNGI EXOTICI: VI.

G Massee.

Of the ten new fungi here described from material in the Herbarium at Kew, five are Indian species collected by Mr. I. H. Burkill, Reporter on Economic Products to the Government of India; two, from Christmas Island and from Borneo respectively, collected by Mr. H. N. Ridley, Director, Botanic Gardens, Singapore; one from British Guiana, collected by Mr. A. W. Bartlett, Superintendent, Botanic Gardens, Georgetown; one from West Africa, collected by Mr. W. H. Johnson, formerly Director of Agriculture, Gold Coast; and one from New South Wales, collected by Mr. Cheel.

Agaricaceae.

Collybia lutea, *Massee.*

Pileus carnosulus, e convexo explanatus, glaber, laevis, luteus, 0·5–1 cm. latus. *Lamellae* subdistantes, angustae, postice rotundatae adnexae vel fere liberae, albidae. *Sporae* ellipsoideae, basi oblique apiculatae, hyalinae, 5 × 3 μ. *Stipes* aequalis, cartilagineus, pileo concolor vel pallidior, circa 2 cm. longus, 1 mm. crassus.

Bengal. Ballygunge, Calcutta ; on a wall, *Burkill*, No. 3, cum icon.

Distinguished amongst known species of *Collybia* by its minute size, yellow colour and almost free gills, not closely approximating to any described species.

Omphalia fuliginosa, *Massee.*

Pileus submembranaceus, convexo-umbilicatus, hygrophanus, glaber, margine crenulatus, fuliginosus, 5–7 mm. latus. *Lamellae* distantes, longe decurrentes, fuliginosae aetate albo-pulverulentae, acie integra. *Stipes* subcartilagineus, glaber, politus, pileo concolor dein expallens, sursum incrassatus, basi subattenuatus alboque tomentosus, 1–1·5 cm. longus, 0·1 mm. crassus. *Sporae* hyalinae, ellipsoideae, 3·5 × 2 μ.

Bengal. Calcutta ; growing on a wall, *Burkill*, No. 1, cum icon.

The fungus is of a uniform smoky colour, the gills becoming somewhat lighter in colour when mature, owing to the dusting of white spores. Superficially resembling *Omphalia umbellifera*, Fr., more especially the dull green form of that species, differing, however, in its smaller size, the absence of striae on the margin of the pileus, and its smaller spores.

Omphalia Oedipus, *Massee.*

Pileus submembranaceus, e convexo expanso-depressus, siccus, laevis, candidus, 1–1·5 cm. latus. *Lamellae* angustae, confertae, longe decurrentes, pileo concolores. *Sporae* hyalinae obovato-oblongatae, 5–6 × 3–3·5 μ. *Stipes* cartilagineus, glaber, fistulosus, deorsum forte incrassatus, albidus, 3–4 cm. longus, apice 1·5–2 mm. basi 6–8 mm. crassus.

Bengal. Calcutta ; on the ground at the base of a wall in one of the streets, *Burkill*, No. 4.

Entirely white ; allied to *Omphalia micromeles*, Berk. & Broome. The essential features of the present species are the white colour of every part ; narrow crowded gills, and the very much swollen basal portion of the stem.

Pleurotus Cheelii, *Massee.*

Pileus membranaceus, dimidiatus, conchiformis, margine interdum fisso, fimbriatus, mox eximie longitudinaliter fibrillosus, postice glaber, stramineus, marginem versus albidus, 2–3 mm. longus, 3–4 mm. latus. *Lamellae* distantes, ventricosae, adnatae, albidae, acie fimbriata. *Sporae* hyalinae, ellipsoideae, basi oblique apiculatae, 5–6 × 3 μ.

AUSTRALIA. Eden, Twofold Bay, N.S.W.; on dead branches, *Cheel*, No. 7.

A very minute species growing in dense troops. When dry the pileus contracts into a ball, and resembles a minute *Peziza* or *Cyphella* in appearance. Allied to *Pleurotus canus*, Quelet, which differs in the lobed margin, larger spores, and in growing on the ground.

Panus Bartlettii, *Massee*.

Pileus carnoso-lentus, tenuis, orbicularis seu reniformis, margine ex involuto expanso, ochraceo-fulvus, dense squamoso-fibrillosus, 3–5 cm. diam. *Lamellae* subconfertae, adnexae seu variantes emarginatae, pileo concolores, acie albida. *Stipes* lateralis, brevis, circa 1 cm. longus, concolor. *Sporae* hyalinae, ellipsoideae, 7 × 5 μ.

WEST INDIES. River Aruka, British Guiana, *Bartlett*, No. 8603.

A very fine and well marked species, interesting on account of its extending the Pleuropod section of the genus to the American tropics. Most nearly allied to *P. stypticus*, Fries.

Nolanea nana, *Massee*.

Pileus carnosulus, conico-campanulatus dein expanso-umbonatus, hygrophanus, laete roseo-carneus mox ambitu ochraceo-suffusus, siccus, 3–5 mm. latus. *Lamellae* confertae, ventricosae, postice attenuato-adnexae, e candido roseo-carneae. *Sporae* subglobosae, nodulosae, carneae, 4–6 μ diam. *Stipes* fistulosus, fibrilloso-striatus, deorsum leviter attenuatus, pileo concolor, circa 1 cm. longus, supra 2 mm. crassus.

BENGAL. Ballygunge, Calcutta; growing on walls, *Burkill*, No. 2, cum icon.

Allied to *Nolanea elaphines*, Berk. & Broome, from Ceylon, differing in its smaller size, bright colour and smaller, coarsely warted spores. An interesting addition to the Fungus Flora of India, as hitherto very few of the Rhodosporeae or pink-spored section of Agarics have been recorded from that country.

Psalliota Burkillii, *Massee*.

Pileus carnosulus, convexus dein expansus, subgibbosus, sericeo-fibrillosus, aureo-fulvellus squamis floccosis miniatis obtectus, margine primitus involutus, velo lacero appendiculis dentiformibus cinctus, 3–4 cm. latus. *Lamellae* postice liberae, confertae, e roseis nigrescentes, acie integra. *Sporae* ellipsoideae basi oblique apiculatae, brunneae, 3·5 × 2 μ *Stipes* solidus, 2–2·5 cm. longus, subaequalis, pileo concolor, infra annulum floccis squamosis evanescentibus tectus. *Annulus* amplus superus, infra squamulis praeditus.

BENGAL. Calcutta; on the ground under a wall in one of the streets, *Burkill*, No. 5, cum icon.

A beautiful and at the same time very marked species. Distinguished at once from every known *Psalliota* by its golden-tawny colour, squamulose ring and the very minute spores with a pronounced oblique basal apiculus.

Hydnaceae.

Hydnum lateritium, *Massee.*

Pileus carnosus, e late umbilicato infundibuliformis, subirregularis, margine saepe sinuato, squamuloso diffractus, lateritius, marginibus rufescentibus, 2–4 cm. latus. *Aculei* decurrentes, acuti, pallide rosei. *Sporae* hyalinae, subglobosae, verruculosae, 5–6 μ diam. *Stipes* solidus, subaequalis, fibrillosus, pallide roseus, 2–4 cm. longus.

Gold Coast. Aburi; growing in humus, *Johnson.*

A very distinct and beautiful fungus, growing singly or in small clusters when the pilei sometimes become concrescent. Somewhat resembling certain forms of *Hydnum ferrugineum*, Fr., in colour and habit, but distinguished by the deeply funnel-shaped pileus, thin flesh and pale-pink or rose-coloured stem.

Polyporaceae.

Daedalea papyracea, *Massee.*

Pileus orbicularis, tenuissimus, lentus, margine acuto interdum lobato, in prima evolutione fusco-aeruginosus, dein pallescens, tomentosus, concentrice zonatus, 16–18 cm. diam. *Pori* flexuosi, in sinulos subcontortos seu lamellosos, labyrinthiformes abeuntes, acie acuta. *Stipes* excentricus, brevissimus, pallidus. *Sporae* hyalinae, subglobosae, 6–7 μ diam.

Malaya. Christmas Island, *Ridley.*

Although a typical *Daedalea* in the tough consistency of the whole plant, and the very sinuous pores, the present species departs from all described forms in the very thin substance of the pileus. Seen from above the plant bears a very close resemblance to *Stereum lobatum*, Fries.

Sphaeriaceae.

Didymosphaeria tetraspora, *Massee.*

Ascomata sessilia, erumpentia, dense gregaria, convexa, glabra, circa ostiolum depressa, ostiolo subprominente, nigra, 0·5 mm. lata. *Asci* cylindracei, basi sensim attenuati, apice obtusa iodo haud tincti, 100 × 20–22 μ, tetraspori. *Sporae* fusoideae, 1-septatae, brunneae, 32–35 × 8–10 μ. *Paraphyses* filiformes, ascis longiores, aequales.

Malaya. Sarawak, Borneo; on dead twigs, *Ridley.*

The ascophores vary in form from circular to broadly elliptical, and are slightly depressed round the short ostiolum, readily distinguished by the tetrasporous asci, and the large brown fusiform spores. In *Didymosphaeria minuta*, Neissl., the asci sometimes only contain four spores; the spores, however, are elliptic-oblong, and much smaller than in the present species.

XXV.—A REVISION OF DUBOUZETIA.

T. A. Sprague.

A sketch of the history of *Dubouzetia* was given in Kew Bull., 1907, No. 1, pp. 10–11, where the genus was compared with *Tricuspidaria*, and the arguments were stated for and against its being generically distinct from the latter. The results of the comparison were somewhat negative, owing to the lack of material preventing the verification of certain alleged generic characters. The matter remaining doubtful, the genera were kept separate provisionally, and two new species of *Dubouzetia* were described in No. 2, pp. 57–58.

Through the kindness of Dr. O. Lignier, Professor at the Faculty of Sciences, and Director of the Botanical Institute at Caen, we have now been able to examine the material of *Dubouzetia* contained in Vieillard's own herbarium, with the following results :— 1, the confirmation of three generic characters, making it evident that *Dubouzetia* is distinct from *Tricuspidaria* ; 2, the reduction of *D. parviflora*, Brongn. et Gris, to *D. elegans*, Brongn. et Gris ; 3, the description of an additional new species, of which imperfect material already existed in the Kew Herbarium.

At p. 10, it was stated the "capsule of *D. elegans* . . . . . is *loculicidal*, with only a very faint indication of a septicidal split, or none at all, so that the distinction drawn between *Dubouzetia* and *Tricuspidaria*, as regards the dehiscence of the fruit, now breaks down."

It now appears, however, in the light of the fresh material, that the condition just described for *D. elegans* is merely the *first stage* of dehiscence : the loculicidal split extends only a short distance (the uppermost $\frac{1}{4}$–$\frac{1}{2}$ of the capsule) and stops ; and the capsule then undergoes almost complete *septicidal* dehiscence, the old fruit finally separating into open cocci, which fall off from a persistent central column about the same time as the expansion of the next set of flowers. By this time the pericarp has separated into a brittle exocarp, and a tough, almost woody, endocarp [*Vieillard*, 2355, in Herb. Inst. Bot. Caen]. In *D. leionema* the dehiscence of the capsule is apparently similar.

In the figure of *D. campanulata* given by Brongniart and Gris in Nouv. Arch. Mus. Hist. Nat. Paris, vol. iv. t. 13, a distinct loculicidal split is shown, which extends from the apex about a third of the way down the capsule, and their description of the dehiscence is as follows :—"Fructus . . . . . septicide dehiscens, carpellis simul apice secundum nervum medium incomplete fissis et marginibus placentiferis disjunctis, demum omnino liberis et endocarpio lignoso incurvato ab epicarpio secedente, columna centrali haud placentifera sola persistente."

The dehiscence of the capsule of *Dubouzetia*, therefore, is *mixed*, with predominance of the *septicidal* type ; that of *Tricuspidaria* on the other hand, is purely *loculicidal*.

The second generic character confirmed for *Dubouzetia* is the orientation of the carpels when all five of them are present, namely, that they are opposite the petals, as stated by Szyszylowicz ; this has now been verified for *D. acuminata* and *D. leionema*, n. sp.

The third character confirmed is the presence of a spiral strophiole at the chalazal end of the seed; this has been verified for *D. leionema*.

It may be useful to give a brief generic description of *Dubouzetia*. The one published by Szyszylowicz in Engl. Jahrb., vol. vi. (1885), p. 453, is excellent, but he unfortunately overlooked the two additional species described by Brongniart and Gris in 1863, which necessitated a widening of the generic characters, and it is stated in his description that the stamens are inserted below the ovary and disk, instead of between them. This is apparently a typographical error, *infra* being inserted in place of *inter*. The same mistake occurs in the description of *Crinodendron* on the same page.

Dubouzetia, Panch. ex Brongn. et Gris in Bull. Soc. Bot. France, vol. viii. (1861) p. 199; Benth. et Hook. f. Gen. Plant. vol. i. p. 240; Szysz. in Engl. Bot. Jahrb. vol. vi. (1885), p. 453; K. Schum. in Engl. u. Prantl, Pflanzenfam. vol. iii. pars. vi. p. 6.

Sepala 5, libera, valvata. *Petala* 5, infra discum inserta, induplicato-valvata (apice excepta), basi bigibbosa. *Discus* hypogynus, 5-lobatus, pilosus, lobis 2-lobatis. *Stamina* 20–40, libera, inter discum et ovarium inserta; antherae lineares, papillatae, apice dehiscentes. *Ovarium* 5-loculare, loculis oppositipetalis, vel 3–4-loculare; loculi 6–13-ovulati, ovulis 2-seriatis; stylus subulatus. *Capsula* lignoso-coriacea, septicide et incomplete loculicide dehiscens. *Semina* 1–3 in loculis, strophiola carnosa spirali chalazica instructa, albumine carnoso. *Cotyledones* planae, ellipticae vel orbiculares. Frutices erecti vel arbor, foliis alternis, pedunculis axillaribus 2-plurifloris, floribus longipedicellatis. *Crinodendron*, Baill. Hist. Pl. vol. iv. p. 198, *pro parte*, non Molina.

According to Szyszylowicz, *Dubouzetia* is closely allied to *Crinodendron* (*Tricuspidaria*), and more distantly to *Elaeocarpus*. For further taxonomic and morphological details, Szyszylowicz's paper should be consulted; and for the anatomy of *D. campanulata*, Boodle's analysis in Kew Bull., 1907, pp. 11–12.

CLAVIS SPECIERUM.

I. Pedicelli et calyces extra dense rufo- vel fulvo-tomentosi :—
  A. Folia coriacea, mucronulata, margine revoluto ... ... 1. *campanulata*.
  B. Folia herbacea, caudiculata, margine haud revoluto ... ... 2. *caudiculata*.

II. Pedicelli et calyces extra pubescentes vel puberuli :—
  A. Folia glabra vel fere glabra; sepala circ. 1 cm. longa (exsiccata, haud explanata) ... ... 5. *elegans*.
  B. Folia subtus appresse tomentella; sepala ultra 1·5 cm. longa ... ... 3. *acuminata*.
  C. Folia subtus nervis densiuscule pilosis, mesophyllo puberulo vel glabro ... ... 4. *leionema*.

1. **D. campanulata**, Panch. ex. Brongn. et Gris in Bull. Soc. Bot. France, vol. viii. (1861), p. 199, et *l.c.*, vol. x. (1863), p. 476 ; Ann. Sci. Nat., Sér. V. vol. i. (1864), p. 352 ; Nouv. Arch. Mus. Hist. Nat. Par., vol iv. p. 34, t. 13 ; Schlechter in Engl. Jahrb. vol. xxxix. p. 183 (1906).

An erect shrub, 1–1·5 m. high, with large red or orange-red flowers.

New Caledonia. Near Kanala, *Vieillard*, 49 ; without precise locality, *Pancher* ; at Ngoye, 100–300 m., *Schlechter*, 15145, 15222 (ex Schlechter).

2. **D. caudiculata**, Sprague in Kew Bull., 1907, p. 57.

An erect shrub, 1–2 m. high, with large white flowers. The petals in the fully developed flower are spathulate-oblong, about 3·7 cm. long and 1·7 cm. broad. Fully developed petals were not available when the species was described.

New Caledonia. Near Gatope, *Vieillard*, 2354 ; *Caldwell*.

3. **D. acuminata**, Sprague in Kew Bull., 1907, p. 58.

Flowers large, yellow. Since the publication of the description, a further specimen of *D. acuminata* has come to hand, in which the sepals are hardly acuminate and the filaments puberulous.

New Caledonia. Near Noumea, *Calawell* ; mountain of Dzumae, *Franc*, 539.

4. **Dubouzetia leionema**, *Sprague*, sp. nov.

Ramuli pubescentes. *Folia* oblonga vel obovato-oblonga, apice rotundata, costa in apiculum producta, basi rotundata vel obtusissima, 4–8 cm. longa, 1·5–2·5 cm. lata, inconspicue repando-dentata, marginibus leviter reflexis, supra primum molliter puberula demum glabrescentia, vena media et lateralibus valde impressis, subtus venis densiuscule pilosis ceterum puberula vel glabriuscula, venis prominentibus, venulis prominulis ; petioli 5–6 mm. longi, dense patule pilosi. *Stipulae* filiformes, pilosae, circ. 4 mm. longae. *Pedunculi* fere 1 cm. longi, breviter pubescentes, pilis longioribus adjectis, 2–3-flori ; pedicelli 2–3 cm. longi, pilosi ; bracteae obsoletae (? vel caducae). *Sepala* anguste lanceolata, acuta, subacuminata, 2·6 cm. longa, circ. 5 mm. lata, extra patule sparsiuscule pubescentia, intus densiuscule appresse pubescentia. *Petala* spathulato-oblonga, 3·5 cm. longa, 1·5 cm. lata, intus prope basin pubescentia, ceterum glabra. *Discus* 2·5 mm. altus, pilosus. *Stamina* circ. 27 ; filamenta usque ad 1·3 cm. longa, glabra ; antherae 9–10 mm. longae, minutissime puberulae. *Ovarium* circ. 4 mm. altum, tomentellum pilis longiusculis adjectis, 5-loculare, loculis 9-ovulatis intus glabris ; stylus circ. 1·7 cm. longus, basi pubescens, medio puberulus, apice glaber. *Capsula* subglobosa, circ. 2 cm. diametro, sparse pubescens, primum parum loculicide, denique perfecte septicide dehiscens. *Semina* 1–3 pro loculo, ellipsoidea, circ. 7 mm. longa, nigra, nitida, strophiolo spirali chalazico instructa. *Cotyledones* orbiculares, vix 4 mm. diametro ; radicula cylindrica, ultra 1 mm. longa.

The specific name refers to the glabrous filaments.

NEW CALEDONIA. Summit of Mt. Ouatendé, near Gatope, *Vieillard*, 2353.

5. **D. elegans**, Brongn. et Gris in Bull. Soc. Bot. France, vol. x. (1863), p. 476 ; Nouv. Arch. Mus. Hist. Nat. Par. vol. iv. p. 36.— *D. parviflora*, Brongn. et Gris in Bull. Soc. Bot. France, *l.c.*

A shrub or tree, with medium-sized yellow flowers. *Vieillard*, 166, on which *D. parviflora* was founded, is evidently a young state of *D. elegans*, with slightly larger leaves than usual.

NEW CALEDONIA. Near Balade, *Vieillard*, 224, 166 ; near Wagap, and near Kanala, *Vieillard*, 50, 2355.

XXVI.—NEW ORCHIDS : DECADE 30.

291. **Bulbophyllum dichromum**, *Rolfe ;* a *B. fuscopurpureo*, Wight, sepalis lateralibus apice connatis, petalis brevibus ciliatis nec longe setiferis differt.

Rhizoma validum. *Pseudobulbi* ovoideo-oblongi, obscure tetragoni, circa 5 cm. longi, monophylli. *Folia* petiolata, coriacea, oblonga, obtusa, circa 17 cm. longa, 4·5 cm. lata ; petiolus 5 cm. longus. *Scapus* suberectus, circa 25 cm. longus, basi vaginis oblongis subobtusis tectus ; racemus laxus, circa 12-florus. *Bracteae* ovato-oblongae, acutae, 8–10 mm. longae. *Pedicelli* subgraciles, 2·5–3 cm. longi. *Flores* speciosi, vitellini, labello purpureo. *Sepalum* posticum ovato-oblongum, subacutum, concavum, 2 cm. longum ; sepala lateralia lanceolata, acuta, apice connata et laeviter recurva, facie minutissime puberula. *Petala* patentia, oblique triangularia, breviter acuminata, ciliata, 4 mm. longa, basi latissima, columnae pedi adnata. *Labellum* carnosum, trilobum, 8 cm. longum ; lobi laterales oblongi, incurvi, 3 mm. longi, apice denticulati ; lobus intermedius recurvus, late oblongus, obtusus, convexus, minutissime papillosus, 5 mm. longus ; discus bicarinatus, profunde canaliculatus. *Columna* latissima, 5 mm. longa, alis crassis acutis ; pes 5 mm. longus.

ANNAM. *Micholitz.*

A very distinct and striking species, introduced by Messrs. Sander & Sons ; flowered in the Royal Botanic Garden, Glasnevin, in February last, when it was sent to Kew for determination by Mr. F. W. Moore, A.L.S. The contrast between the dark purple lip and the bright yellow of the rest of the flower is very striking. A figure has been prepared for the Botanical Magazine.

292. **Bulbophyllum tridentatum**, *Rolfe* ; ad *B. mandibulari*, Reichb. f., accedit, sed sepalis lateralibus attenuatis angustis, petalis brevibus, et columnae brachiis tridentatis differt.

Folia elliptico-oblonga, subobtusa, coriacea, circa 15 cm. longa, 4·5 cm. lata ; petiolus 2·5 cm. longus. *Scapi* 2·5–4 cm. longi, 2–3-flori. *Bracteae* ovato-oblongae, breviter acuminatae, basi tubulosae, 1·2–1·8 cm. longae. *Pedicelli* 3–4 cm. longi. *Sepalum* posticum ovato-lanceolatum, acuminatum, basi concavum, 2·5–3 cm. longum ; sepala lateralia attenuata, lineari-oblonga, acuta, 4·5–5 cm. longa. *Petala* ovata, acuta vel subobtusa, 1·2 cm. longa. *Labellum*

carnosum, recurvum, acutum, lateraliter subcompressum, margine valde acutum, 1·2–1·4 cm. longum. *Columna* lata, 1 cm. longa, brachiis acuminatis inaequaliter tridentatis.

British New Guinea. Milne Bay, *Micholitz.*

Introduced by Messrs. Sander & Sons, in whose nursery at St. Albans it flowered in May, 1902. The sepals and petals are dull yellowish green, spotted with dull purple, the lip light brown, suffused with purple on the sides and apex, and the column green. The specific name is given in allusion to the tridentate arms of the column, there being a broad tooth at the base in front, and a narrower one about the middle behind.

293. **Coelogyne Mooreana**, *Hort. Sand.*; affinis *C. cristatae*, Lindl., foliis longioribus, scapis altioribus, bracteis deciduis et floribus minoribus differt.

Pseudobulbi ovoideo-oblongi, obtuse tetragoni, canaliculati, circa 7 cm. longi, apice angusti, diphylli. *Folia* elongato-lanceolata, acuta, 7-nervia, basi in petiolum attenuata, 24–50 cm. longa, 3–4 cm. lata, arcuata. *Scapi* erecti, 30–40 cm. alti; racemi 4–7-flori. *Bracteae* deciduae. *Pedicelli* 2·5–3·5 cm. longi. *Flores* speciosi, albi, labelli disco aureo-maculato et pilis subclavatis flavis instructis. *Sepala* elliptico-oblonga, acuta, laeviter carinata, 4–5·5 cm. longa. *Petala* elliptica, acuta, 4–5·5 cm. longa. *Labellum* trilobum, 3–3·5 cm. longum, basi concavo-saccatum; lobi laterales oblongi, obtusi, incurvi et columnam involventes; lobus intermedius ovatus, obtusus; discus crebre piloso-papillosus, pilis gracilibus 3–4 mm. longis et apice subclavatis. *Columna* gracilis, late alata, circa 2·5 cm. longa.

Annam. Laos side of the Lang Bian Range, at 1,300 m. alt., *Micholitz.*

Introduced by Messrs. Sander & Sons, St. Albans, with whom it flowered in December, 1906. It is dedicated to Mr. F. W. Moore, A.L.S., Keeper of the Royal Botanic Gardens, Dublin, who also flowered it at about the same time. It is the nearest ally of the well-known *C. cristata*, Lindl., which has yet appeared, and closely resembles it except in the characters above pointed out.

294. **Calanthe burmanica**, *Rolfe*; affinis *C. Ceciliae*, Low, floribus minoribus, segmentis angustioribus et calcare gracilius differt.

Folia elliptico-lanceolata, acuminata, plicata, subtus puberula, basi in petiolum attenuata, lamina circa 20–25 cm. longa, 3–5·5 cm. lata. *Scapus* erectus, circa 45 cm. altus, velutinus; racemus multiflorus, 10 cm. longus. *Bracteae* ovatae, acuminatae, undulatae, velutinae, apice recurvae, 6–10 mm. longae. *Pedicelli* velutini, 2–2·5 cm. longi. *Sepala* elliptico-ovata, acuta vel apiculata, 10–12 cm. longa. *Petala* elliptica vel elliptico-lanceolata, acuta, 10–12 mm. longa. *Labellum* columnae adnatum, profunde trilobum, 14–16 mm. longum; lobi laterales oblongi, obtusi, 6 mm. longi; lobus intermedius anguste obtriangularis, medio bifidus, segmentis obovatis; crista tricarinata, carinis tuberculoso-verrucosis; calcar gracile, laeviter incurvum, 1·5–2·5 cm. longum. *Columna* lata, 4 mm. longa, alae late auriculatae.

Burma. Shan States.

Flowered with Mr. F. W. Moore, A.L.S., at the Royal Botanic Garden, Glasnevin, in September, 1896, and subsequently. The flowers are mauve-purple, with a yellow crest.

295. **Cymbidium pumilum**, *Rolfe;* a *C. ensifolio*, Swartz, foliis et scapis brevioribus, floribus minoribus et labelli canaliculo omnino aperto et edentato differt.

Pseudobulbi ovoidei, parvi, 3-5-phylli. *Folia* elongato-linearia, subacuta, canaliculata, recurva, 15–30 cm. longa, 6–12 mm. lata. *Scapi* suberecti, 10–15 cm. longi, basi vaginis lanceolatis acutis paucis obtecti, multiflori. *Bracteae* triangulari-subulatae, 2–4 mm. longae. *Pedicelli* 2–2·5 cm. longi. *Sepala* subpatentia, oblonga, subobtusa, circa 2 cm. longa. *Petala* subconniventia, anguste elliptico-oblonga, subobtusa, 1·5 cm. longa. *Labellum* suberectum, trilobum, 12–14 mm. longum ; lobi laterales erecti, oblongi, obtusi ; lobus intermedius oblongus, obtusus, recurvus ; discus canaliculatus et obscure bicarinatus ; canaliculo aperto et edentato. *Columna* incurva, angulata, 12 mm. longa.—*Kinriyohen*, Somoku Zusetsu, xviii. t. 13.

China. Yunnan ; Tsekou, *Manberg.*

This Orchid has long been known from a figure in the above-cited Japanese work, but I cannot find that it has ever been described. Plants were introduced by Mr. Peter Barr, through a Japanese nurseryman, and flowered at Kew in May, 1900. It was believed to be only a garden plant in Japan, and recently it has appeared in a collection of dried plants made in Yunnan by Père T. Manberg, and presented to Kew by Mr. A. K. Bulley. The sepals and petals are light reddish brown, the latter shading off to yellow at the margin, and the lip is white, with a few red-brown spots on the front lobe, numerous minute lines and dots on the side lobes, and the disc and keels bright yellow.

296. **Stauropsis chinensis**, *Rolfe;* a *S. gigantea*, Benth., foliis duplo minoribus, floribus paullo minoribus differt.

Herba epiphytica, erecta. *Caules* circa 12 cm. alti, radicantes. *Folia* approximata, coriacea, lineari-oblonga, brevissime et obtuse biloba, 15–20 cm. longa, 2–3 cm. lata. *Scapi* axillares, suberecti, 15–20 cm. longi ; racemus multiflorus. *Bracteae* patentes, late ovatae, subobtusae, concavae, 6–8 mm. longae. *Pedicelli* crassi, circa 1·5–2 cm. longi. *Flores* speciosi, flavi, brunneo-maculati. *Sepala* obovato-oblonga, obtusa, 2–2·5 cm. longa, circa 1·5 cm. lata ; lateralia infra apicem apiculata. *Petala* sepalis similia sed paullo angustiora. *Labellum* trilobum ; lobi laterales erecti, oblique triangulares, obtusi, 4 mm. lati ; lobus intermedius lateraliter compressus, lanceolato-oblongus, obtusus, 2 cm. longus ; callus laminatus, erectus, triangularis, subobtusus, 3 mm. latus. *Columna* crassissima, circa 5 mm. longa.

China. Kwangsi ; 20 miles from Lungchow, on the way to Telang, epiphytic on trees, *Morse*, 552.

The flowers are said to have a strong and disagreeable perfume, and the blotches on the sepals and petals to consist of red circles. It bears a close resemblance to the Burmese *S. gigantea*, Benth. (*Vanda gigantea*, Lindl., Bot. Mag. t. 5182), except in its much less robust habit.

297. **Stauropsis luchuensis**, *Rolfe*; habitu *S. undulatae*, Benth., sepalis petalisque obovato-oblongis obtusis nec undulatis et flavis brunneo-maculatis.

Herba scandens. *Caules* 30 cm. alti, radicantes. *Folia* disticha, coriacea, oblonga, brevissime et obtuse biloba, 10–14 cm. longa, 2–3 cm. lata. *Scapi* suberecti, 15–40 cm. longi, vaginis cupulatis tecti; racemus multiflorus. *Bracteae* squamiformae, obtusae, circa 2 mm. longae. *Pedicelli* 2 cm. longi. *Flores* speciosi, flavi, brunneo-maculati. *Sepala* obovato-oblonga, obtusa, 1·3–1·5 cm. longa. *Petala* sepalis paullo angustiora. *Labellum* carnosum, subtrilobum, 1·5 cm. longum, basi saccatum; lobi laterales columnae adnati, breves, 3 mm. lati; lobus intermedius oblongus, obtusus, lateraliter compressus, medio gibbosus, basi concavus; saccus obtusus, 3 mm. longus. *Columna* crassa, 5 mm. longa. —*Niumen-Ran*, Somoku Zusetsu, xviii. t. 23.

Luchu Archipelago. Island of Niumen (Iriomote).

A specimen of this Orchid was presented to Kew by Prof. J. Matsumura, D.Sc., LL.D., who remarks that it has been cultivated in greenhouses at Tokio for a long period, under the name of *Niumen-Ran* (Niumen-Orchid), under which name it was figured in the Japanese work cited above as long ago as 1856. Specimens were not previously available for comparison.

298. **Saccolabium Woodfordii**, *Rolfe*; a *S. flexo*, Reichb. f., sepalis petalisque nec ligulatis, labelli lobis lateralibus membranaceis obtusis nec minutis distinctum.

Caulescens, rami flexuosi. *Folia* 2–2·5 cm. distantia, linearioblonga, inaequaliter biloba, 8–15 cm. longa, circa 1·5 cm. lata. *Pedunculi* axillares, crassiusculi, 4–5 cm. longi; racemi ovoidei, densiflori. *Bracteae* . . . . *Pedicelli* graciles, 7 mm. longi. *Sepalum* posticum ovato-ellipticum, obtusum, concavum, 4 mm. longum; *sepala* lateralia elliptico-oblonga, obtusa, subobliqua, 4 mm. longa. *Petala* ovata, obtusa, 4 mm. longa. *Labellum* trilobum; lobi laterales lati, obtusi, membranacei, 1 mm. longi; lobus intermedius late elliptico-oblongus, obtusus, subcarnosus, 2 mm. longus; calcar inflato-oblongum, obtusum, 5 mm. longum. *Columna* lata, 1 mm. longa. *Capsula* fusiformi-oblonga, 2·5 cm. longa.

Solomon Islands. Rennell Island, *C. M. Woodford.*

A drawing, accompanied by a few dried flowers, was sent for determination by Mr. C. M. Woodford, Resident and Deputy-Commissioner in the Solomon Islands, who remarks that the flowers are pale vermilion, tipped with brown on the inside of the lip, and that it has not been observed on any other island.

299. **Cleisostoma secundum**, *Rolfe*; a speciebus Burmannicis labelli lobis lateralibus subobsoletis facile distinguendum.

Caulis brevis. *Folia* lanceolato-oblonga, subacuta, laeviter recurva, crasso-coriacea vel subrigida, 9–13 cm. longa, 1·3–1·5 cm. lata. *Scapus* decurvus vel subpendulus, 7–10 cm. longus, 10–12-florus; flores secundi. *Bracteae* latet triangulares, obtusae, 2 mm. longae. *Pedicelli* 1·3–2 cm. longi. *Sepala* patentia, elliptico-oblonga, obtusa, 6 mm. longa. *Petala* sepalis angustiora, caeterum

similia. *Labellum* subintegrum, elliptico-oblongum, obtusum, carnosum, 6–7 mm. longum, medio concavo-canaliculatum ; calcar saccato-oblongum, 4–5 mm. longum ; callus late oblongus, apice bilobus. *Columna* crassa, 4 mm. longa ; rostellum 1 mm. longum.

Burma.

Introduced by Messrs. Hugh Low & Co., Enfield, who flowered it in May, 1890 ; it was also subsequently sent from the Royal Botanic Gardens, Glasnevin, by Mr. F. W. Moore, A.L.S. The flowers are light rose-pink, with the front lobe of the lip rose-purple.

300. **Disa Bakeri**, *Rolfe* ; *D. Deckenii*, Reichb. f., accedit, sed fere omnibus partibus duplo majoribus et calcare elongato differt.

Herba erecta, robusta, glabra, circa 45 cm. alta. *Folia* radicalia vel subradicalia lineari-oblonga, subobtusa, suberecta, subcoriacea, 15–20 cm. longa, 1·8–2·5 cm. lata, caulina in vaginas gradatim decrescentia, acuta, 5–15 cm. longa. *Spica* densiflora, 10–15 cm. longa, circa 4 cm. lata. *Bracteae* lanceolatae, acuminatae, 2–3 cm. longae. *Pedicelli* circa 1·5 cm. longi. *Sepalum* posticum cucullatum, late ovatum, obtusum vel apiculatum, circa 1 cm. longum ; calcar lineare, incurvum, 1·5 cm. longum ; *sepala* lateralia oblique ovato-oblonga, obtusa, patentia, circa 1 cm. longa. *Petala* ovato-oblonga, obtusa, 5 mm. longa. *Labellum* lineari-oblongum, obtusum, circa 7 mm. longum. *Columna* brevis, lata ; anthera erecta.

British East Africa. Kinagop Hill and Mau, at 2,400 to 3,000 m., *G. Sandbach Baker*. "Pink Orchid."

XXVII.—MISCELLANEOUS NOTES.

Sir Thomas Hanbury, K.C.V.O.—The loss to Kew of another generous friend has to be recorded in the death after a short illness, on the evening of March 9th, at his Riviera home, the Palazzo Orengo, La Mortola, Italy, in his 75th year, of Sir Thomas Hanbury.

Thomas Hanbury, third son of Daniel Bell and Rachel Hanbury, was born on June 21, 1832, at Clapham. At the age of nine he was sent to a school at Croydon, afterwards at Epping, where the majority of the boys were members of families belonging to the Society of Friends. After leaving school Thomas Hanbury was placed for a time with a tutor, Mr. Richardson, and thereafter at the age of 17 entered the employment of Messrs. W. J. Thompson & Sons, tea brokers, of 38, Mincing Lane. His capacity and the character of his work in the counting house of this firm were such that at the age of 21 he was considered capable of joining, along with his cousin Thomas Christy, two other gentlemen, William Crampton and Charles Pullam, in a business partnership, that of Hanbury & Co., which started at Shanghai.

From 1853 till 1872, with two short breaks in 1858–9 and 1866–8, when he took holidays to Europe, Thomas Hanbury lived the life of a merchant in China. During his business connection with Shanghai, Hanbury served on the Municipal Council and

took an active part in laying out and improving the amenities of the foreign settlement. At the same time he distinguished himself during the troublous times of the Taiping rebellion, which was in progress when he went to China, and was not finally put down till 1864, by his unbroken friendship for the native merchants and by his protection of their interests, so that more than any Englishman of his time he gained the confidence and affection of the Chinese business community.

In March, 1867, during his second holiday in Europe, Hanbury, to escape the rigours of the English spring, visited the south of France, where his brother Daniel had already travelled and sketched. While staying at Mentone he paid a visit to the promontory of La Mortola two miles within the Italian frontier, where the ruined Palazzo Orengo stood among its olive groves and vine terraces. Realising its possibilities as regards gardening, and charmed with its natural beauty, Hanbury purchased the house and a piece of ground round it in May 1867, with the intention of making the place his home on retirement, and of creating, in conjunction with his brother Daniel, the eminent authority on medicinal plants, a botanic garden in the grounds around the house.

In March 1868, Hanbury married Katherine Aldam Pease, the eldest daughter of Thomas Pease, of Westbury-on-Trym, near Bristol, member of a branch of the well-known North Country family of the name belonging to the Society of Friends. After two years' residence at Shanghai, where their eldest son was born, Hanbury and his wife settled down to a winter life at the Palazzo Orengo, their summers being spent in England, or in the mountains of the Alpes Maritimes, or in Switzerland.

Education in Liguria when Hanbury first settled there was in a very backward state. To remedy this so far as he could he built in 1880 a school for the boys and girls of the three villages of La Mortola, Ciotti, and Grimaldi, and in 1892 another for the children of the valley of Latte and its villages. In the latter year also he built a Botanical Institute at Genoa which he presented to the University there in commemoration of the fêtes in honour of Columbus. In 1897 he built at Ventimiglia a library to hold the books of the ancient Approsian library which had long been neglected. In the same year he built at Alassio a hall and library for the benefit of English winter visitors, and to commemorate the Diamond Jubilee of Her Majesty Queen Victoria, he presented a memorial drinking fountain to the town of Mentone. A short time ago it was announced that he had provided funds for the establishment of a public garden at Ventimiglia.

Hanbury's services to the cause of Italian education were recognised by his being created in 1885 Cavaliere, and in 1888 Commendatore, of the Order of the Crown of Italy. Later he was further honoured by being created Commendatore of the Order of SS. Maurizio and Lazzaro, and in 1892 he was awarded a gold medal as a benefactor of public instruction.

The fame of the garden at La Mortola, which is known throughout the world of horticulture, has grown with the years that have elapsed since its first inception. The task of originally furnishing

it was facilitated by the intimate intercourse established with the leading horticultural establishments of Europe, but more particularly with Kew and with Antibes. The intercommunication between La Mortola and Kew has been close and unbroken since the date of Hanbury's settlement on the Riviera and the exigencies of space forbid an exhaustive account of the exchanges that have taken place between the two establishments. A catalogue of the plants in the garden, published in 1889, enumerates some 3,600 different species, a number that has since been augmented by the addition of further species of scientific or economic interest and value. With characteristic thoughtfulness an entrance fee was charged to the public for permission to enter the garden, the proceeds being devoted to the maintenance of the hospital at Ventimiglia.

Among the numerous contributions to the collections of living plants at Kew sent in exchange from the garden at La Mortola may be mentioned many succulents, especially Agaves, Aloes, Euphorbias, and Stapelias; species of *Citrus*; many Bamboos. In addition to these, numerous sub-tropical plants raised from seeds received from La Mortola have been added to the collections.

Among the gifts from the same source to the Museum collections at Kew from 1881 onwards especially valuable are a fine collection of fruits of various species of *Citrus*, and sections of the stems of *Casuarina equisetifolia*, *Euphorbia abyssinica*, *Juniperus oxycedrus*, *Quillaia saponaria*, all grown in the grounds of the Palazzo Orengo.

The Library at Kew was indebted to Hanbury for the gift of some 30 rare and valuable volumes on botanical subjects, as recorded in the *Bulletin* for 1893, p. 22. In 1893 also he presented to Kew, as an addition to the collection of portraits of botanists there, a copy of the portrait of Matthioli which is preserved in the Museum attached to the Botanic Garden at Pisa. The name of the artist who painted the original is unknown. The copy was made for Hanbury's brother Daniel by Giuseppe Miniati of Pisa, in May 1872. It was also due to Hanbury's kind intervention that in the same year the original plaster cast of the medallion by Woolner of his brother Daniel, the gift of which was recorded in the *Bulletin* for 1893, p. 187, was deposited at Kew.

Kew, however, was by no means the only recipient in England of Hanbury's bounty. Among his thoughtful gifts to his own countrymen may be mentioned especially the presentation in 1892, to the Museum of the Pharmaceutical Society, of the valuable collection of "Materia Medica" accumulated by his brother Daniel, and the gift to the Library of the same Society of an equally valuable collection of books bearing on the same subject. Again, in 1903 Sir Thomas purchased the garden, 60 acres in extent, at Wisley, in Surrey, which had been made famous by the efforts of its former proprietor, the late Mr. G. F. Wilson. This garden he presented to the Royal Horticultural Society, who have since moved there from Chiswick and have expressed their gratitude for the gift that permitted them to change their abode.

In the *Botanical Magazine* Sir Thomas took a great and ever increasing interest, supplying freely from among the rarities at

La Mortola material for the figures given in that work. The first of the series was *Senecio Haworthii* (vol. 99, t. 6063 : 1873), a flowering specimen of which was sent to Sir J. D. Hooker by D. Hanbury, who obtained it from the garden of his brother T. Hanbury. The next to appear is given in the volume for 1891, and the subjoined list, showing this and all that have appeared since, is of interest and may be useful for reference purposes :—

Vol. 117 : 1891.	t. 7194.	*Citrus Aurantium.*
„ 120 : 1894.	t. 7333.	*Kalanchoe marmorata.*
„ 122 : 1896.	t. 7473.	*Pittosporum eriocarpum.*
„ 123 : 1897.	t. 7516.	*Bignonia buccinatoria.*
	t. 7524.	*Grevillea Hilliana.*
	t. 7529.	*Tristania laurina.*
	t. 7568.	*Quillaja Saponaria.*
„ 125 : 1899.	t. 7655.	*Dahlia Maximiliana.*
	t. 7662.	*Yucca Whipplei.*
	t. 7667.	*Aloe Schweinfurthii.*
	t. 7670.	*Ephedra altissima.*
„ 128 : 1902.	t. 7837.	*Aloe pendens.*
„ 129 : 1903.	t. 7882.	*Aloe vulvoviolacea.*
„ 130 : 1904.	t. 7948.	*Aloe Baumii.*
	t. 7988.	*Cydonia sinensis* (fruit).
„ 132 : 1906.	t. 8065.	*Polygala apopetala.*
„ 133 : 1907.	t. 8122.	*Aloe pallidiflora.*
	t. 8134.	*Aloe campylosiphon.*

The one hundred and nineteenth volume of the *Botanical Magazine* was dedicated by Sir J. D. Hooker to Hanbury, the letter of dedication being worded as follows :—

"My dear Hanbury,—It is no less a duty than a pleasure to offer to you the dedication of a volume of the *Botanical Magazine* as a tribute to the value of your services to Scientific Horticulture in creating a garden of Exotic plants at Mentone which, in point of richness and interest, has no rival amongst the private collections of living plants in the world ; and in munificently founding the 'Istituto Botanico Hanbury' in the Botanical Gardens of the University of Genoa, the early years of which are already so full of promise for the future of Scientific Botany in Europe."

In 1882 Her Majesty Queen Victoria, during her stay at Mentone, paid two afternoon visits to La Mortola and sketched the views from the windows of the Palazzo Orengo. In 1898 His Majesty the King, then Prince of Wales, visited La Mortola in company with the Grand Duke Michael of Russia, and in the same year Her Majesty the Empress Frederick paid several visits to the spot during her stay at Bordighera. In 1901 the King honoured Hanbury by creating him a Knight Commander of the Royal Victorian Order.

Great as is the sorrow which Sir Thomas Hanbury's death brings to all those who knew him intimately, it may be confidently

said that those, outside the circle of his own family, who most feel his loss are the countless poor who have benefitted by his wise generosity. His funeral, which took place on March 11th, bore striking testimony to the esteem in which he was held by his Italian neighbours of all classes. As the cortege passed along the coast from La Mortola to San Remo, where the body was cremated, the shops in every place were closed and the whole population joined the sad procession ; about 7,000 people were present to pay their last respects to one who had been in the truest sense their friend.

A substitute for Coca.—Mr. E. M. Holmes lately sent to Kew for determination some fragments of a plant from the Hanbury Herbarium of the Pharmaceutical Society, collected in Peru, by Warscewicz, in 1853. There is an accompanying note that the plant called *Tampusa* was used like Coca when ascending the Cordillera. It has been identified by Mr. Sprague as *Werneria dactylophylla*, Schultz-Bip., a species occurring in Bolivia and Peru at altitudes of 16,000 to 18,000 feet. *Werneria* is a genus of high-level *Compositae* almost or perhaps quite peculiar to the Andes. Many of them, including the one in question, are dwarf, densely tufted shrubs, though commonly described as herbs.

W. B. H.

Splachnobryum delicatulum, *Broth.*—A specimen of this new species has been presented to the Herbarium by Mr. H. N. Dixon, M.A., F.L.S., by whom it was described in the Journal of Botany, 1907, p. 81, tab. 484, fig. A. It was discovered by Mr. G. Webster, of York, in October, 1904, growing on brickwork in a stove containing orchids at Baldersby Park, Yorkshire. Later in the year the plant had disappeared, but reappeared the following autumn (being probably an annual), when it was also found under similar conditions in an orchid-house at Harrogate. Since then it has been found in a similar situation at York. As in two of these cases the orchids were exclusively South American, it is possible that the moss also had been introduced from that region.

The stem is from 3 to 8 mm. high and simple, or nearly so. The dark green crowded leaves are ovate or oblong-subspathulate, and rounded at the apex ; their cells are large and irregularly long hexagonal-rhomboid, except in the upper part, where the marginal row is much smaller, subquadrate, and forms a distinct border. The minute theca is borne on a seta about 3 mm. long, and is covered by a conic-beaked operculum. A special feature is the ring of hyaline cells between the rim of the capsule and the true peristome teeth, which projects above the former and constitutes a form of "pre-peristome." A single cell of this ring is situated opposite to, and is double the width of each peristome tooth, appearing (when viewed from without) like a wide hyaline border to the base of the papillose orange tooth, which is destitute of a median line. The peristome teeth originate so deeply within the theca that they are exserted for only half their length.

The systematic position of the genus *Splachnobryum*, founded by C. Mueller in 1869, has been the subject of much difference of opinion. Dr. V. F. Brotherus (in Engl. & Prantl, Nat. Pflanzenf. i. iii. 420) places it in *Pottiaceae* and enumerates 23 species; since then three others have been described in addition to the present one. Most of these are tropical or sub-tropical, but two have been found under circumstances similar to those of *S. delicatulum*. One of these, *S. Wrightii*, C. Muell., a West Indian species, was found on the top of a wall in a forcing-pit at the Royal Botanic Gardens, Glasnevin, and an account of it was published by Dr. R. Braithwaite in the Journal of Botany, 1872, p. 193. The other, *S. Corbieri*, Ren. et Card. (Bull. Soc. Roy. Bot. Belg. xli. p. 61, 1905), was described from plants growing on a rotten stump in the hot-houses at Parc Liais, Cherbourg.

C. H. W.

Research in Jodrell Laboratory in 1906 :—

Boodle, L. A.—The Monoecism of *Funaria hygrometrica*, Sibth. (Ann. Bot., Vol. XX., pp. 293–299, with four Figs. in text.)

Boodle, L. A.—Lignification of Phloem in *Helianthus*. (Ann. Bot., Vol. XX., pp. 319–321.)

Hill, T. G.—On the Seedling-Structure of certain Piperales. (Ann. Bot., Vol. XX., pp. 161–175, t. 10, and three Figs. in text.)

Hill, T. G.—On the Presence of a Parichnos in Recent Plants. (Ann. Bot., Vol. XX., pp. 267–273, tt. 19 and 20.)

Massee, G.—Revision of the Genus *Hemileia*. (Kew Bull., 1906, pp. 35–42, with one plate.)

Massee, G.—Plant Diseases : IV.—Diseases of Beet and Mangold. (Kew Bull., 1906, pp. 49–60, with five Figs. in text.)

Massee, G.—Perpetuation of "Potato Disease" and Potato "Leaf-Curl" by means of hybernating mycelium. (Kew Bull., 1906, pp. 110–112.)

Massee, G.—Plant Diseases : V.—Diseased Apples and Melons from the Cape of Good Hope. (Kew Bull., 1906, pp. 193–196, t. 1.)

Massee, G.—Plant Diseases : VI.—Potato Leaf-Curl. (*Macrosporium solani*, Cooke. Syn., *M. tomato*, Cooke.) (Kew Bull., 1906, pp. 242–245.)

Massee, G.—Fungoid Diseases of the Sweet Pea. (Sweet Pea Annual, 1906, pp. 18–22. London ; Nat. Sweet Pea Soc.)

[**Massee, G.**]—"Canker" Fungus and Woolly Aphis. (Journ. Board Agric., Vol. XIII., p. 55.)

[**Massee, G.**]—Tree Root Rot. (Journ. Board Agric., Vol. XIII., pp. 111–114, with one Fig. in text.)

[**Massee, G.**]—The Perpetuation of Potato Disease and Potato Leaf-Curl. (Journ. Board Agric., Vol. XIII., pp. 232–235.)

[Massee, G.]—The Spread of Fungus Diseases by means of Hybernating Mycelium. (Journ. Board Agric., Vol. XIII., pp. 257–264.)

[Massee, G.]—Prevention of Decay in Ripe Fruit. (Kew Bull., 1906, pp. 399–400.)

[Massee, G.]—A Method of Preventing the Rapid Decay of Ripe Fruit. (Journ. Board Agric., Vol. XIII., pp. 562–565.)

Salmon, E. S.—On *Oidiopsis taurica* (Lév.), an endophytic member of the Erysiphaceae. (Ann. Bot., Vol. XX., pp. 187–200, tt. 13 and 14.)

Scott, D. H. and Maslen, A. J.—Note on the structure of *Trigonocarpon olivaeforme*. (Ann. Bot., Vol. XX., pp. 109–112.)

Scott, D. H.—The structure of *Lepidodendron obovatum*, Sternb. (Ann. Bot., Vol. XX., pp. 317–319.)

Scott, D. H.—On the structure of some Carboniferous Ferns. (Journ. R. Micr. Soc., 1906, pp. 519–521.)

Scott, D. H.—The Occurrence of Germinating Spores in *Stauropteris Oldhamia*. (New Phytologist, Vol. V., pp. 170–172, with two Figs. in text.)

Scott, D. H.—The Fern-like Seed-Plants of the Carboniferous Flora. (Ueber die wichtigsten neueren Ergebnisse der Phytopaläontologie. Résultats scientif. du Congrès internat. de Bot. Wien 1905, Jena 1906, pp. 279–296, with 17 Figs. in text.)

Scott, D. H.—On *Sutcliffia insignis*, a new Type of Medulloseae from the Lower Coal-Measures. (Trans. Linn. Soc. Bot., 2 ser., Vol. VII., pp. 45–68, tt. 7–10.)

Scott, D. H.—The Present Position of Palaeozoic Botany. (Progressus Rei Botanicae, Vol. I., pp. 139–217, with 37 Figs. in text.)

Worsdell, W. C.—The Structure and Origin of the Cycadaceae. (Ann. Bot., Vol. XX., pp. 129–159, with 17 Figs. in text.)

Mr. L. A. Boodle made an examination of *Funaria hygrometrica* with a view to explaining the contradictory statements in the literature regarding the distribution of the sexes in this plant, and obtained the result that this species is generally or perhaps always monoecious. He also extended some earlier observations on lignification of phloem in *Helianthus*, and studied some cases of fasciation, and some points in the structure of the ovules of *Cephalotaxus* and *Cycas* : see above.

Sir Dietrich Brandis carried out an investigation on the structure of the leaves of Bamboos, and found a striking uniformity in the main structural features, combined with diversity in details.

Mr. Hickling, of the Victoria University, Manchester, studied the structure of the Calamarian cone *Palaeostachya* with special reference to the course of the vascular bundles supplying the sporophylls, this being a character of some importance for comparison with other cones belonging to the fossil Equisetales.

Dr. A. A. Lawson, of Stanford University, California, completed a research on the gametophytes, fertilisation and embryo of *Cephalotaxus drupacea*, which he had begun three years previously in America. This work forms one of his series of investigations on the morphology of the Gymnosperms, and yields data which are regarded as important in phylogenetic considerations, and appear to indicate that *Cephalotaxus* is not to be regarded as a primitive type of Conifer.

Dr. D. H. Scott and Mr. A. J. Maslen investigated the structure of two species of *Trigonocarpus*, the fossil seeds of Palaeozoic plants probably related to *Medullosa*. The seeds, in various states of preservation, are well known in deposits belonging to the Coal-Measures, and prove to have a micropylar beak of considerable length : see above.

Dr. Scott completed his work on the structure of *Sutcliffia insignis*, a new type of Medulloseae from the Lower Coal-Measures. The specimen consists of a stem with leaf-bases attached. The vascular system of the stem consists of a main stele (of the protostelic type), from which subsidiary steles were given off, and by subdivision gave rise to numerous leaf-traces. Dr. Scott also examined the structure of *Lepidodendron obovatum* in a specimen showing both internal structure and satisfactory external characters, and obtained the result that these two classes of characters do not necessarily correspond in the Lepidodendreae. Dr. Scott also described the occurrence of germinating spores in a fossil sporangium (*Stauropteris Oldhamia*). The mode of germination of the spores shows that *Stauropteris*, which probably belongs to the Botryopterideae, is a true fern, and not a Pteridosperm. Dr. Scott also wrote a general review of the present position of Palaeozoic Botany, which was specially called for on account of the rapid progress of this subject in recent years : see above.

Mr. R. B. Thomson, of the University of Toronto, examined the structure of the ovule, the pollen-tubes, &c., in the Araucarieae.

Mr. W. C. Worsdell continued an extended study of the vascular anatomy of numerous Dicotyledons, for the purpose of determining, on these lines, their relationship to Monocotyledons, and the nature of the primitive type of structure from which the present vascular structure of both groups of plants has been derived. Mr. Worsdell was also engaged in making drawings and collecting data for the production of a general morphological work on Vegetable Teratology. He also published a summary of his investigations on the Cycads, with a statement of his views as to their origin from Pteridosperms. The vascular structure of the stem is regarded as derived from that of the Medulloseae : see above.

Investigations in Plant Pathology at Kew during 1906.—During the past year some four hundred reports bearing on various plant diseases have been issued. Some of the material for investigation and report was received through the Board of Agriculture and Fisheries, some was addressed directly to Kew from various

correspondents scattered throughout the United Kingdom. The preparation of these reports involved a considerable amount of laboratory work, as in the case of unusual or little known diseases the presence of one or more fungi on the diseased portion did not necessarily prove them to be individually or collectively the cause of the mischief. Under the circumstances each fungus present had to be obtained as a pure growth, and afterwards each one tested separately as to its power of primarily reproducing the disease on a healthy plant of the same kind as the diseased one from which the infecting material was obtained. Bearing on this question, it may be stated that extended observations strongly suggest, and in many instances prove, that, apart from the "rusts" (*Uredineae*), "smuts" (*Ustilagineae*), and certain other truly parasitic forms, fungi are not so frequently the primary cause of disease as they are generally supposed to be. For example, the minute fungus called *Pythium debaryanum*, Hesse, is considered the primary cause of the "damping off" of seedlings. In reality this fungus can only grow in a very damp situation, and consequently only destroys seedlings that are growing in damp, badly ventilated and badly lighted places. When seedlings are growing in open ground exposed to light and air, they resist infection by the fungus. Hence, "damping off" is primarily due to bad cultivation. The host of fungi known as wound-parasites are all secondary agents in promoting disease, the primary cause being the agent causing injury to the tissues, and thus enabling the fungus to enter. The punctures made by mites, "green fly," "scale insects," &c., serve as starting points through which fungi gain an entrance to the living tissues.

The exceptional weather of last season was the cause of some unusual forms of injury to plants. The somewhat severe late frosts suddenly following a period favourable to rapid growth, resulted in the collapse and death of the young foliage of many kinds of plants. Cabbages suffered severely. The sudden thawing of the frozen leaves caused the epidermis of the under surface of the leaf to separate from the adjoining tissue. A few days later, when the comparatively uninjured upper surface of the leaf again commenced to grow, it assumed a curled or puckered appearance, due to the unyielding dead epidermis. Eventually leaves thus injured shrivelled and died. The leaves of various evergreens, *Aucuba*, &c., were also injured in a similar way.

The following, among other subjects, were also investigated in the Jodrell Laboratory :—A disease attacking apples from Cape Colony ; the transmission of disease in potatoes from one generation to another by means of hybernating mycelium in the tubers ; prevention of rapid decay of ripe fruit ; the cause of "winter-rot" in potatoes ; "heart-rot" of swedes and mangolds, &c.

Plant nurseries and fruit farms, situated in different parts of the country, were visited for the purpose of studying and reporting on diseases.

Botanical Magazine for March.—The plants figured are : *Aloe pallidiflora*, A. Berger, *Blepharocalyx spiraeoides*, Stapf, *Primula deorum*, Velen., *Caiophora coronata*, Hook. & Arn., and *Paphiopedilum villosum*, Pfitzer, var. *annamense*, Rolfe. The *Aloe* is

probably South African. It is a stemless plant, with a dense rosette of linear-lanceolate leaves, dull green above, and marbled with long whitish marks. The branched inflorescence of pale flesh-coloured flowers is 2½–4 ft. high. The material figured was from a plant which flowered in the garden of the late Sir Thomas Hanbury, K.C.V.O., at La Mortola. *Blepharocalyx spiraeoides*, from Brazil, is a new species with small lanceolate-linear leaves and terminal cymes of many small pale yellow flowers. It was sent to Kew by Baron Capanema, Director of Telegraphs of Brazil, in 1885. The genus is closely allied to *Myrtus*. *Primula deorum* is a pretty alpine species belonging to the section *Auricula*, and is a native of Bulgaria. It has been in cultivation at Kew since 1892. The specimen figured was received from Mr. Max Leichtlin, of Baden-Baden, in 1904. *Caiophora coronata* is a Loasaceous plant furnished with stinging bristle-like hairs. It has bipinnatifid leaves, and rather large white flowers borne singly on long peduncles. The specimen figured was grown in the garden of Mr. H. J. Elwes, F.R.S., having been raised from seed collected by him in the Andes, where it is found, from the Argentine Republic to Peru, at elevations of 9,300–14,600 ft. The *Paphiopedilum* has been introduced from Annam by Messrs. Sander & Sons, who presented a flowering plant to Kew about a year ago. It differs from the type, a native of Burma, in having longer, narrower and more erect leaves, and in the colour of the dorsal sepal.

Botanical Magazine for April.—The plants figured are *Diospyros Kaki*, Linn. f., *Arctostaphylos Manzanita*, Parry, *Calliandra portoricensis*, Benth. var. *major*, Sprague, *Meconopsisis bella*, Prain, and *Cymbidium erythrostylum*, Rolfe. The *Diospyros* is a native of Eastern India, China, and Japan, where it is also very much cultivated, in numerous varieties, for the sake of its edible fruit, popularly known as the Date Plum. Its introduction into cultivation in this country dates from the year 1789, but it has never become common. The Kew plant which supplied the material figured was purchased from a nurseryman at Montpellier in 1890, and first produced fruit, while still in a young state, in 1893. It has since fruited annually, and is now a standard about 7 feet high. The Californian *Arctostaphylos Manzanita* is a shrub or small tree, with broad leathery leaves and terminal many-flowered panicles of white or pinkish flowers. As in other arborescent species of the genus, the bark peels off annually. The specimen figured was obtained from a plant raised from seeds purchased from an American nurseryman in 1897. This plant is now about a yard in height and width, and has proved to be quite hardy here. *Calliandra portoricensis*, a native of Mexico and Central America, has, under various names, long been an inhabitant of our gardens. The variety, which was purchased in 1906 from a nurseryman in Hyères as "*Inga alba*," differs from the type in having deltoid calyx-lobes and longer stamens. Its flower-heads are globose, about 2 inches in diameter, and pure white, their ornamental character being due to the very numerous long-exserted stamens. *Meconopsisis bella* is known only from two localities on the eastern frontier of Nepal, where it was first discovered in 1888

by one of Sir George King's collectors. It is the smallest species of the genus and an exceedingly pretty one, but, unfortunately, difficult to cultivate. Success in flowering it has at last been achieved in the Royal Botanic Garden, Edinburgh, where plants had been raised from seeds distributed from the Royal Botanic Garden, Calcutta. One of these plants bearing a number of rather large pale blue flowers borne singly on scapes 1½–3 ins. long, was presented by Prof. Bayley Balfour, F.R.S., in August, 1906, and from it the figure was prepared. The beautiful *Cymbidium* is another of Messrs. Sanders' introductions from Annam. It flowered for the first time under cultivation in the Royal Botanic Garden, Glasnevin, in November, 1905, and material having been sent to Kew for determination, a figure was prepared for the magazine. The specific name was given on account of the crimson column. The rest of the large flower, except part of the lip, which is red-purple, is white.

Bitter Pit in Cape Apples.—Writing from Pretoria, 4th December, 1906, on the subject of the *Kew Bulletin*, the Government Horticulturist, Transvaal Department of Agriculture, remarked :—" I am specially interested in the Horticultural section, and whilst I do not by any means agree with many conclusions arrived at in the pages of your publication, I am anxious to keep in touch with English ideas." Replying to this passage from Kew, 31st December, 1906, it was said :—" It is inevitable that the same subject, if at all a debatable one, should present itself under different aspects to different minds which may be occupied in considering it. But while we may be led at Kew to suggest particular conclusions from a consideration of the facts at our disposal, we endeavour at all times to remain receptive to new facts and to modify any conclusions which new facts show to be untenable. I should therefore feel extremely grateful to you if you will be so good as to favour us with a reference to those conclusions arrived at in the pages of the *Bulletin* with which you find yourself unable to agree. If at the same time you will further favour us with your reasons for disagreeing with them, this might materially assist in promoting, what I feel is our common object, the advancement of knowledge."

Mr. R. A. Davis, Government Horticulturist, Transvaal, has courteously responded to this invitation in a letter dated Pretoria, 25th February, 1907. From this letter it transpires that the conclusions with which he does not agree are contained in an article which appeared in the *Kew Bulletin* for 1906, pp. 193–5, embodying a report on a consignment of diseased apples forwarded officially for examination by the Cape of Good Hope Commercial Agency, with the explanation that the disease by which these apples were affected appeared to prevent the fruit from being of any commercial value. The apples in question were made the subject of a very careful examination which failed to afford any indication that either fungi or insects could be held accountable for their condition. The conclusion was formed that the disease under consideration is of a purely physiological nature, and in

summing up his conclusions the writer of the report expressed the view that "the injury was due to the fruit being subjected to too high a temperature during the period of ripening. Whether this occurred previous to or during the voyage could not be determined. The fact that the lower half of each apple that was buried in the packing material remained perfectly free from disease suggests that if the fruit was completely covered with packing material so as to exclude the free access of air, no injury would be sustained."

In his covering letter Mr. Davis explains that he appreciates the fact that the writer of the report approached the subject dealt with under some difficulty, and the additional information he appends is sent in the hope that it may be of some assistance to the investigator in arriving at a solution of a somewhat difficult problem. How real the difficulty is may be gathered from the fact that the writer of the report found in every instance the lower half of each apple that was buried in the packing material perfectly free from disease, and that this is borne out by the lower of the two figures in the plate which accompanies the report. That figure, it is hardly necessary to say, represents, as accurately as it is possible by means of a photograph to represent, the conditions present in what was justifiably considered a typical instance of the disease as exemplified by the apples in the consignment submitted for report. It is therefore interesting and instructive to find that Mr. Davis has to say that this plate "does not give a clear impression of the disease. This originates much nearer the core of the fruit in nearly every case, and apparently develops towards the outside of the apple."

With regard to the possibility that the injury may be due to the fruit being subjected to too high a temperature during the first period of ripening, Mr. Davis says:—"I have seen apples ripen perfectly for many years past in climates hotter than that from which the specimens came on which the report was made. I have also watched them in Cape Colony, and it is only within the past few years that this disease has been observed. Apples are shipped to this colony from Australia, Tasmania, and Canada; the disease is apparent in consignments from *each* of these colonies, also in America, both in the Eastern and Western States." With regard to the possibility that the condition is the effect of subjection to too high a temperature during the voyage, and to the suggestion that if the fruit were completely covered by packing material no injury would have occurred, Mr. Davis writes:—"I would state that I have unfortunately seen thousands of specimens having identically the same appearance as those submitted hanging on the trees; have packed them, examined them and found no difference between them and others which have been picked from the same trees, wrapped and packed completely over with suitable material, excepting that the latter seemed to develop the disease more rapidly. Cold storage experiments made with fruit half ripe and nearly ripe, placed in storage without sign of mark on them, have shown that when taken out disease has developed to even a greater extent than in the previous cases with the same peculiar susceptibility to pitting at the *calyx end of the fruit only*."

From this Mr. Davis is of opinion that the appearance of the fruit cannot be explained by the practice of "half" packing. He continues :—"I agree . . . . that it" [the disease] "is of purely physiological nature. At one time I held the opinion that it might be due to the widespread use of 'Northern Spy' stocks, as this apple is itself the most subject of all to the trouble, also the wood is given to 'canker' in some instances. This also is a fallacy, as I have found 'Bitter Pit' on trees grafted on 'French Crab' and other stocks, but in no instance, so far, on seedlings. Our natural varieties which reproduce themselves truly are all immune."

If, as Mr. Davis explains, 'Bitter Pit' is not confined to South Africa, and if, as was stated when apples so affected were first sent to Kew for examination, this disease destroys the commercial value of the fruit, it is to be anticipated that its study will be undertaken by workers in other apple-producing countries. For the information of all who are, or are likely to become, interested in the subject, it seems advisable to make available without delay the observations recorded by Mr. Davis.

Flowering of Orchis longibracteata, *Biv.*—Through Dr. A. Günther Kew received in February, 1906, and again on February 22nd of the present year, a specimen of *Orchis longibracteata*, Biv., syn. *Aceras longibracteata*, Reichb. f., and *Barlia longibracteata*, Parl., which flowered in the open ground at Bury St. Edmunds at this early period. This orchid is a native of the north littoral of the Mediterranean, from Spain to Italy and Greece, and its flowering season is from January to March. Mr. Duncan Parker, J.P., of Clopton Hall, near Bury St. Edmunds, brought home tubers from Hyères in 1904 or 1905, and planted them in a meadow. Each year since some of them have developed vigorous spikes of flowers in February. So far as my experience in Sussex goes, our earliest orchids, *Orchis mascula* and *O. Morio*, do not flower before April, and Bromfield gives the same for the Isle of Wight. That this Mediterranean orchid should have preserved the power and habit of flowering so early in the season when transferred to a much colder climate is a biological fact of sufficient interest to be placed on record.

W. B. H.